GENERALIZED DQ METHODS, RELATED DISCRETE ELEMENT ANALYSIS METHODS AND EDQ BASED TIME INTEGRATION SCHEMES FOR STATIC AND TRANSIENT ANALYSES

C. N. Chen

Department of Naval Architecture and Marine Engineering
National Cheng Kung University
Tainan, Taiwan 70101
cchen@mail.ncku.edu.tw

The method of DQ can be used for the discrete analysis of computational mechanics [1]. Because only problems having simple regular domains and under simple external environment can be solved by using the DQ, the application of this method is very limited. The author has generalized and extended DQ which results in obtaining the generic differential quadrature (GDQ) [2] and the extended differential quadrature (EDQ) [3]. The grid model can have an arbitrary configuration. A certain order derivative or partial derivative of the variable function with respect to the coordinate variables at a discrete point, which might not be a node, is expressed as the weighted linear sum of the values of function and/or its possible derivatives or partial derivatives at all nodes.

The author has also used DQ, GDQ and EDQ to develop the discrete element analysis methods DQEM [4], GDQEM [5], DQFDM [6] and DQFEM [7] for solving a generic engineering or scientific problem having an arbitrary domain configuration. EDQ has also been used to develop direct time integration scheme for solving a discrete dynamic equilibrium equation system.

The developed numerical methods can be used to effectively solve static and transient continuum mechanics problems. Many analysis models using these methods has been developed. The results will be presented to demonstrate the developed discrete analysis models.

References

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